Cryptocurrencies and climate change: a big problem

Published

12 December 2022

Category

Technology

Key topics

Centre for Climate Finance and Investment, Climate Change, Climate Finance, Competition, Cryptocurrency, Finance, Sustainability

As nations struggle to keep to the targets set by the Paris Agreement, we can no longer afford to ignore cryptocurrencies' massive carbon footprints

In September 2022, one of the world’s most popular cryptocurrencies made a monumental move to clean up its act – by switching to a new method of validation. In doing so, it slashed its energy use and potentially saved millions of tonnes of carbon emissions.

This long-anticipated move was made by Ethereum, second only to Bitcoin in popularity and the first leading "crypto" to switch to this new method. Ethereum’s move is estimated to cut its energy use by 99.5 per cent, according to the Ethereum Foundation.

If other leading cryptos were to follow suit, the impact upon global warming would be dramatic; **the most popular virtual currencies each consume the equivalent power of a medium-sized country**. Their soaring popularity – despite a market crash in 2022 – means their energy use has rocketed: **since 2021, Bitcoin has consumed more than 200 terawatt hours (TWh) of electricity,**

up from around 75 TWh in the previous few years.

This heavy carbon footprint has led some countries such as China to ban the trade and "mining" of cryptocurrencies. And there’s another cost: the vast amount of electrical hardware required to keep track of transactions on the blockchain, the indelible public ledger. It’s here where all crypto transactions are recorded after being calculated.

Why are cryptos so power hungry?

Cryptos are virtual: they are created or "mined" by individuals or groups using powerful computers around the clock to solve complex mathematical puzzles. When crypto owners buy or sell a coin, or a slice of it, the transaction is collected in a block. Individuals or "miners" compete to be the fastest to solve the block puzzle. The fastest miner able to solve the puzzle adds the new block to the blockchain – and scoops a reward, such as new coins (or a fraction of them) and a transaction fee.

If crypto prices rise, then mining coins becomes more profitable, and more miners join the race, which makes the competition harder – resulting in greater energy use. In their search for the solution, the unsuccessful miners will still have consumed vast quantities of power.

This is called **proof-of-work (PoW) mining** and it’s virtually tamper proof, hence a reluctance to change. PoW allows the crypto community to track the source of all the virtual currency, and check for double spending, as well as unlock new coins.

Ethereum, launched in 2015, has now switched over to a different method of validation, known as **proof of stake (PoS)**. It requires a fraction of the energy and computing power and a laptop is powerful enough for a user to validate it. Rather than compete as in PoW, users can put in a "stake" – a holding of tens of thousands of dollars of Ethereum – to be eligible to be chosen via an otherwise largely random selection. If selected, a user is asked to validate a block of transactions on the blockchain and earns just a transaction fee.

This is a much less energy intensive process: there’s no longer a need to be the fastest among miners. In fact, no mining is required at all with PoS, as all cryptos in circulation have already been created. But if validators are inaccurate or dishonest,

they risk losing their entire stake.

How widespread is PoS?

PoW cryptos still dominate the market. There are more than 20,000 cryptocurrencies but fewer than 300 use PoS rather than PoW. Shifting from one system to the other is complex: it took years and a few dry runs for Ethereum to make the change, after declaring its intention to move over in 2017. But by and large the Bitcoin community – by far the largest – is yet to be convinced and prefers to stick to tried and tested methods. **Whatever the benefits of crypto, it will damage the climate.**

Now we must ask, **are we more scared of the predictable consequences of a financial crisis or the unpredictable ones of a climate crisis?** As nations are failing to meet commitments to limit global warming to two degrees Celsius above industrial levels as laid out in the 2015 Paris Agreement, crypto's carbon costs deserve urgent scrutiny.

If law makers could force crypto miners to reveal the environmental cost of their work, the transparency and subsequent reputational cost could deter investors and pressure cryptos to clean up. At the same time, markets could flag the greener benefits of PoS cryptos and contribute to a major market shift away from PoW. At the latest UN climate summit in Egypt, we heard that humanity must "co-operate or perish". As we race towards a climate crisis, we can't afford to ignore crypto's unacceptable carbon footprint.

This article draws on findings from "Damage Limitation: Cryptocurrencies and Climate Change" by Carmine Russo (Imperial London).

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